CLAIMS

1. An electromotive power assisted bicycle, comprising:

a drive shaft to be rotated by a pedal effort;

a primary sprocket fixed to said drive shaft for transmitting said pedal effort to a drive wheel;

a secondary sprocket fixed to said drive shaft coaxially with said primary sprocket;

a pedal effort detection means for detecting the pedal effort;

an electromotive power output unit box detachably mounted to a body of the bicycle for outputting an electromotive power in response to the pedal effort detected by said pedal effort detection means;

a power sprocket coupled to a rotating output shaft of said electromotive power output unit box;

an auxiliary chain stretched across between said secondary sprocket and said power sprocket; and

a battery bracket capable of accommodating a battery for said electromotive power output unit box.

2. An electromotive power assisted bicycle in accordance with claim 1, in which said battery bracket comprises:

a bracket member capable of detachably accommodating said battery and interlocking the accommodated battery with a key; and

a bracket retainer to be coupled with said bracket member so as to clamp a body frame.

3. An electromotive power assisted bicycle in accordance with claim 1, in which said electromotive output unit box

comprises:

a box having an opening and capable of accommodating a plurality of gears inside thereof;

a cover for closing said opening; and

a plurality of coupling means for coupling said box with said cover in respective different coupling positions, wherein

a plurality of shaft end portions of gears is held by said cover, and

said coupling positions of the plurality of coupling means are arranged such that shaft centers of the plurality of gears whose shaft end portions are held by said cover may pass through an inside of respective different triangles defined by connecting said coupling positions of the plurality of coupling means.

4. An electromotive power assisted bicycle in accordance with claim 1 or 3, further comprising:

a supporting section for rotatably supporting said drive shaft; and

a unit mounting bracket having a bottom plate and a pair of side plates extending from said bottom plate approximately in the same vertical direction, wherein

said unit mounting bracket is fixed to said supporting section in a state where said supporting section is clamped between said pair of side plates with said drive shaft inserted through side holes formed in said pair of side plates respectively,

said electromotive power output unit box is mounted

to said bottom plate.

5. An electromotive power assisted bicycle in accordance with claim 2, in which said bracket retainer is formed as a rigid band for clamping said body frame.

6. An electromotive power assisted bicycle in accordance with claim 2, in which said bracket member has a supporting section for supporting a battery to be inserted therein and an extension plate extending from said supporting section, wherein

said battery comprises one or more electric cells enclosed by a housing, said housing being provided with a slot, and

when said battery is accommodated in said bracket member, said extension plate is accommodated in said slot.

7. An electromotive power assisted bicycle in accordance with claim 5, in which an orientation of said bracket member with respect to said bracket retainer has been set such that the battery accommodated in said bracket member is positioned approximately horizontally in a longitudinal direction thereof.

8. An electromotive power assisted bicycle in accordance with claim 2, in which said body frame to which said battery bracket is fixed is a seat post, and said seat post is coupled to a connection means fixed to a body, wherein said connection means extends through an inside of the body frame.

9. An electromotive power assisted bicycle in accordance with claim 5, in which said bracket retainer includes

guards in both edges of said band extending in a longitudinal direction, said guards extending approximately in a vertical direction with respect to a band surface.

10. An electromotive power assisted bicycle in accordance with claim 2, in which said bracket member has an interlocking section that is engaged with said housing of the battery to thereby fix the battery when said key is turned.

11. An electromotive power assisted bicycle in accordance with claim 2, in which said bracket member and said battery comprise, respectively, those portions that are interlocked to each other at the time of insertion of said battery, and said interlocking section is fixed when said key is turned.

12. An electromotive power assisted bicycle in accordance with claim 3, in which said shaft center of the gear whose shaft end portion is held by said cover passes through the vicinity of a center of gravity of said triangle.

13. An electromotive power assisted bicycle in accordance with claim 3, in which said shaft center of the gear whose shaft end portion is held by said cover extends approximately in a vertical direction with respect to at least one of said triangle.

14. An electromotive power assisted bicycle in accordance with claim 3, in which said gear whose shaft end portion is held by said cover is a helical gear.

15. An electromotive power assisted bicycle in accordance

with claim 3, in which said coupling means is a bolt, and a bolt hole through which said bolt is to be inserted is formed in said cover, while a threaded hole with which said bolt is to be engaged is formed in said box.

16. An electromotive power assisted bicycle in accordance with claim 3, in which said respective different triangles have no shared area portion.

17. An electromotive power assisted bicycle in accordance with claim 3, in which an electric motor is disposed in an inside of said electromotive power output unit box, and said plurality of gears reduces a revolving speed of said electric motor.

18. An electromotive power assisted bicycle in accordance with claim 17, in which said electric motor is a flat motor.

19. An electromotive power assisted bicycle in accordance with claim 4, in which said bottom plate has a mounting hole for inserting a bolt therethrough, said bolt being used to fix said electromotive power output unit box to the bottom plate on a surface thereof defined to be opposite to said supporting section, wherein when said electromotive power output unit box is mounted, a head of said bolt is located in a front surface side of said bottom plate facing to said supporting section.

20. An electromotive power assisted bicycle in accordance with claim 4, in which an end portion of said bottom plate is coupled with a band means for tightly clamping a body frame.

21. An electromotive power assisted bicycle in accordance with claim 20, in which said bottom plate comprises a pushing means for applying a pushing force onto the body frame.

22. An electromotive power assisted bicycle in accordance with claim 21, in which said pushing means is composed of at least two pushing screws that have been screwed in penetrating said bottom plate from a location off from a center axis line of said bottom plate.

23. An electromotive power assisted bicycle in accordance with claim 4, in which said unit mounting bracket further comprises a sliding means capable of slidably moving said electromotive power output unit box in one direction along said bottom plate.

24. An electromotive power assisted bicycle in accordance with claim 23, in which said sliding means comprises:

a guide means for operatively guiding said electromotive power output unit box so as not to be out of said one direction when said electromotive power output unit box is slidably moved; and

a moving means capable of adjusting a moving operation of said electromotive power output unit box along said one direction.

25. An electromotive power assisted bicycle in accordance with claim 24, in which said guide means has a bottom guiding elongated hole formed in said bottom plate, wherein

said electromotive power output unit box is slidably

moved in a state where a raised portion protruding from said electromotive power output unit box has been inserted through said bottom guiding elongated hole.

26. An electromotive power assisted bicycle in accordance with claim 25, in which said guide means has side guiding elongated holes formed in at least a pair of side plates, wherein

said electromotive power output unit box is slidably moved in a state where a protrusion protruding from said raised portion in a side face direction has been inserted through said side guiding elongated hole.

27. An electromotive power assisted bicycle in accordance with claim 26, in which said pair of side plates further comprise side extension segments extending from base end portions thereof in a longitudinal direction of said bottom plate, wherein

said side guiding elongated holes are formed in said side extension segments.

28. An electromotive power assisted bicycle in accordance with claim 25, in which said electromotive power output unit box includes a stabilizing area capable of slidably contacting with said bottom plate across a part or a full of surrounding area of a base end portion of said raised portion.

29. An electromotive power assisted bicycle in accordance with claim 24, in which said moving means comprises:

an end plate extending from an end portion of said bottom plate approximately in a vertical direction with

respect to said bottom plate, and

a pushing screw that has been screwed in said bottom plate, wherein

said electromotive power output unit box is pushed in and slidably moved by said pushing screw.

30. An electromotive power assisted bicycle in accordance with claim 24, in which said moving means comprises:

a threaded shaft attached to said electromotive power output unit box such that it extends in said one direction;

an end plate extending from an end portion of said bottom plate approximately in a vertical direction with respect to said bottom plate and having an end hole through which said threaded shaft is to be inserted; and

a bolt means to be engaged with a portion of said threaded shaft protruding from said end hole, wherein

said electromotive power output unit box is slidably moved along with said threaded shaft by a revolution of said bolt means.

31. An electromotive power assisted bicycle in accordance with claim 4, in which said bottom plate comprises at least one rib that is raised up from one surface of said bottom plate and depressed from the other surface opposite to said one surface.

32. An electromotive power assisted bicycle in accordance with claim 31, in which said rib extends linearly over substantially full width of said bottom plate between said pair of side plates.

33. An electromotive power assisted bicycle in accordance with claim 4, in which said bottom plate, in at least one edge thereof on which said side plate is not extending, includes a bent segment that has been bent approximately at a right angle with respect to the bottom surface of said bottom plate.

34. An electromotive power assisted bicycle in accordance with claim 4, in which said unit mounting bracket further comprises a corner-rib segment formed in a region where said side plate intersects with said bottom plate in a form depressed inward said bracket so as to connect said side plate and said bottom plate.

35. An electromotive power assisted bicycle in accordance with claim 4, in which each of said pair of side plates comprises a partial circular segment with side hole formed in a central area of said circular segment through which said drive shaft is to pass.

36. An electromotive power assisted bicycle in accordance with claim 1, in which said secondary sprocket and said power sprocket are disposed in an inner side of the body than said primary sprocket.

37. An electromotive power assisted bicycle in accordance with any one of claims 1 through 36, in which a one-way clutch is interposed on a transmission path of an electromotive power from said electromotive power output unit box to said primary sprocket, wherein said one-way clutch is configured and disposed so as to transmit a torque in a direction from said electromotive power output

unit box to said primary sprocket but not to transmit the torque in the inverse direction.

38. An electromotive power assisted bicycle in accordance with claim 1, in which said electromotive power output unit box contains a single chip control circuit of 16 bits in minimum and an electric motor, wherein said single chip control circuit provides a whole control of an electronic processing of the electromotive power assisted bicycle as well as a software control in a pulse modulation control system of said electric motor based on at least said pedal effort that has been detected

39. An electromotive power assisted bicycle in accordance with claim 20, in which a V-shaped concave face to be engaged with said body frame is formed in the end portion of said bottom plate coupled with said band means.

40. An electromotive power assisted bicycle in accordance with claim 20, in which said band means has a plurality of holes, wherein one end portion of said bottom plate is fixed to the body frame by inserting a fixing means through either one of said holes and engaging said fixing means with said bottom plate.

41. An electromotive power assisted bicycle in accordance with claim 20, in which said unit mounting bracket further comprises a sliding means capable of slidably moving said electromotive power output unit box in one direction along said bottom plate, and

said bottom plate has a mounting hole that allows a fixing means for mounting said electromotive power output

unit box to said bottom plate to pass through and that is elongated along said one direction, wherein

said fixing means is engaged with a mounting plate disposed in a body frame side of said bottom plate.

42. An electromotive power assisted bicycle in accordance with claim 5, in which said bracket retainer is a band having a halving portion, wherein said halving portion is fastened so that both fasing ends of the halving portion are close to each other, whereby said bracket retainer is fixed to the body frame.

43. An electromotive power assisted bicycle in accordance with claim 42, in which said bracket retainer has a mounting section for mounting said bracket member in a position of the band defined to be opposite to said halving portion.

44. An electromotive power assisted bicycle in accordance with claim 2, in which said bracket retainer and said bracket member have curved sections associatively working for clamping the body frame and mounting surfaces to face each other.

45. An electromotive power assisted bicycle in accordance with claim 6, in which said supporting section is configured by combining a first supporting section having said extension plate with a second supporting section supporting said battery from an opposite side to said extension plate.

45. An electromotive power assisted bicycle in accordance with claim 45, in which said second supporting section is

made of resin and comprises a terminal to be connected with a terminal of said battery.

46. An electromotive power assisted bicycle in accordance with claim 6, in which said supporting section is formed into a box shape with one end open for accommodating a part of said battery.